Component Mixing

STARS uses K-values to determine component transitions. We will only look at the model in question: Water, dead oil, and gas dissolved in the oil (no free gas).

A central notion is *mole fractions:*

Gas mole fraction, denoted	y
Oil mole fraction, denoted	x
Water mole fraction, denoted	w

Then, component mixing is defined by *K-values*, which (in general) are functions of pressure and temperature.

Aqueous components; water is the reference liquid phase, and *K*-values defined by

K(gas/liq) = y/w
K(liq/liq) = x/w

Oleic components; oil phase is the reference liquid, and *K*-values:

K(gas/liq) = y/x
K(liq/liq) = w/x

Default Partitioning of Components (used when user input is absent or defaulted)

- Aqueous components are based in the water phase. No partitioning in the oil phase
- Oleic components are based in the oil phase, and will not vaporize. No partitioning into aqueous phase (Desired behavior for dead-oil component)

Gas-Liquid K value Correlations

Specified in STARS by defining 5 parameters, $kv_1 – kv_5$.

The *K*-value of component *i* is then:

$$K_i(p,T) = \left(\frac{kv_{1i}}{p} + kv_{2i} * p + kv_{3i}\right) e^{\left(\frac{kv_{4i}}{T - kv_{5i}}\right)}$$

As we (for now) are only interested in *isothermal* models, the exponential term vanishes.

Defining *kv*-values is done by the keywords KV1 – KV5.

Any non-defined KV-value will be set to zero. Note exception: For the *aqueous components*, setting all *kv*s to zero forces the use of STARS internal aqueous model. To actually set K = 0 for water, define a nonzero value for kv_4, and set the others to zero.

Syntax

KV1 $kv_{1,1}$ $kv_{1,2}$ … $kv_{1,numx}$
KV2 $kv_{2,1}$ $kv_{2,2}$ … $kv_{2,numx}$
KV3 $kv_{3,1}$ $kv_{3,2}$ … $kv_{3,numx}$
KV4 $kv_{4,1}$ $kv_{4,2}$ … $kv_{4,numx}$
KV5 $kv_{5,1}$ $kv_{5,2}$ … $kv_{5,numx}$
(where *numx* is the total number of components in the liquid phases (water or oil).